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Item 4 of the provisional agenda*

COUNTRY REPORTS ON THE CURRENT STATUS AND ISSUES OF SURVEYING, CHARTING AND MAPPING AT THE NATIONAL LEVEL: NEEDS AND REQUIREMENTS VERSUS REALITY IN THE REGION

Qatar's Digital Base Map Database

Paper submitted by Qatar**

* E/CONF.87/1.

** Prepared by Zul Jiwani, Head of the Centre for Geographic Information Systems, Qatar.

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INTRODUCTION

In the Middle East, in the State of Qatar, there has been a most amazing transformation. One which is all the more astonishing because of the rapidity by which it took place. Qatar's traditional manual methods of managing its land, and infrastructure have given way, in less than three years, to an extremely sophisticated, highly automated methodology based on a Digital Base Map Database (DBMD) designed with users in mind.

In 1988 two delegates from Qatar, interested in Geographic Information Systems and digital mapping visited Canada. They liked what they saw, particularly in Ontario. It was apparent, from the Ontario model, that the implementation of an effective digital mapping program and GIS first required an in-depth user needs study to determine the ways in which the digital maps and associated GIS technology could and would be used. Qatar enlisted the help of the Canadian Government in carrying out such a User Needs Study. Thus Canada and Qatar became partners in progress. The study was completed in January 1989. Those were the stepping stones that led to the formation of the National Geographic Information Systems (GIS) Steering Committee, The Centre for GIS, and an on-line, high resolution, Digital Base Map Database (DBMD) that has already become a functional tool in the hands of government agencies and citizens alike.

The National GIS Steering Committee, chaired by the Minister, Ministry of Municipal Affairs and Agriculture, reports directly to a group of five of Qatar's fourteen Cabinet ministers and oversees the operation of The Centre for GIS. The Centre in turn is responsible for providing and maintaining a state-of-the-art, on-line DBMD for all of Qatar's urban areas having populations in excess of 1000. This DBMD was compiled with resolutions suitable for the production of 1:1000 and 1:10,000 scale mapping and is topologically structured so as to accommodate the integration, correlation and analysis of a variety of user themes.

The Centre for GIS also provides expertise and training in the operation and use of GIS to the various government

ministries and assists them in developing and implementing their GIS applications and systems which are integrated with and depend heavily on the DBMD. Thus far personnel from eight of Qatar's fourteen ministries have received in-depth training on the system. Several of these ministries have already begun to reap the benefits of the DBMD and some of its associated features, including a street network complete with street names, numbers, zones and addresses for all urban areas in both Arabic, the native language, and English. The street network component of the DBMD has, in the form of a PC product called Electronic Place Finder (EPF), found its way into the private homes and businesses of Qatar.

GIS Units are being established in all fourteen of Qatar's ministries. Some are in place now, others are in various stages of implementation. The staff of each GIS Unit are responsible for: developing, enhancing and maintaining those applications peculiar to their ministry; maintaining the hardware and software in the Unit; and data capture. Each ministry's GIS Unit has its own work station(s), plotters and digitizers all of which are connected by a high speed data network to each other and to the DBMD at The Centre for GIS.

In the absence of an effective cadastre, Qatar must for the present rely on accurate large scale topographic base maps for the bulk of its land-related applications. The DBMD from which these maps are generated is but one of the exemplary features of the overall system. A general review of the quality assurance standards that have made this DBMD so reliable and useable will be covered in this paper together with some of the unique features of the database that has made it so popular in Qatar.

THE STATE OF QATAR

The State of Qatar has a population of approximately 400,000 eighty percent of which reside in the capital City of Doha. Situated mid way on the west coast of the Persian Gulf, Qatar covers 11,437 sq.km. The terrain consists primarily of flat rocky surfaces, arid planes and sand dunes, with some fertile areas. The discovery of vast oil reserves in the 1940's increased the economic growth of the state dramatically and contributed to the significantly high values of urban real estate. While many magnificent walled mansions abound in the urban areas of Qatar, many of the traditions of this independent and sovereign state have not changed. Only recently have street signs been erected and addresses assigned to buildings.

THE CENTRE FOR GIS, STATE OF QATAR

Armed with a comprehensive User Needs Study, the government of Qatar prioritized its tasks. First and foremost was the creation of a unit to develop digital mapping specifications and standards, acquire the necessary hardware and software, develop

a digital map monitoring capability, train staff and implement the digital mapping program. This work began in the GIS Division of the Ministry of Industry and Public Works but as the work and products produced by this unit began to have an influence on, and effect the work of a variety of different ministries the government moved the unit out from under the control of any single ministry and established The Centre for GIS, State of Qatar.

Once the DBMD was well underway, The Centre for GIS acquired the necessary hardware and software for eight of Qatar's ministries. It hired and trained the managers, analysts, technologists and technicians that are in the GIS Units of each of those ministries. And it established a high speed data network link between them all and itself.

HARDWARE AND SOFTWARE

After reviewing several operational GIS facilities and investigating the software capabilities available that would meet the needs identified in its User Needs Study, Qatar selected ESRI's ARC/INFO GIS software and DEC VAX hardware.

TRAINING

The Centre for GIS also has a fully equipped training centre and provides regular training on GIS, ARC/INFO, VMS and related technology to government personnel.

DATABASE SPECIFICATIONS AND DATA DICTIONARIES

In addition to being responsible for the DBMD, The Centre for GIS is working hand-in-hand with several of Qatar's ministries to develop database specifications and data dictionaries for each of their respective disciplines. The creation and use of these detailed specifications has introduced order and discipline to the collection, naming, coding and storing of data. Not only have they standardized and streamlined data collection and other procedures and techniques in those ministries where they have been implemented but in addition their use has considerably improved such things as field service and inventory maintenance. To ensure they are not taken lightly the following statement of authority is placed on a single page at the beginning of the database specifications and data dictionaries for each of the government ministries:

Authority

These specifications are administered under the authority of the National Geographic Information Systems (GIS) Steering Committee. It is the responsibility of this committee to provide national

standards and specifications for all GIS databases in the State of Qatar that are compatible, and provide for effective sharing/exchange of data where such sharing is warranted. These specifications have been approved by the National GIS Steering Committee prior to distribution.

Any changes to these specifications will be made upon approval by the National GIS Steering Committee in order to ensure that this compatibility for data sharing is never jeopardized. Such requests for changes should be submitted in writing to the GIS Standards and Specifications Secretariat, National GIS Steering Committee, P.O. Box 22088, Doha, Qatar.

QATAR'S DIGITAL BASE MAP DATABASE

At the present time all of Qatar's GIS applications depend heavily on the Digital Topographic Base Map Database. The lack of a comprehensive cadastre magnifies this need. Thus the implementation of an accurate on-line digital map database at resolutions suitable for the many applications that were identified in the User Needs Study was of prime importance.

The hardcopy map sheets themselves irrespective of scale are rectangular in shape being one metre in width by one half metre in height. They are oriented to and structured on the Qatar National Grid which is a modified Transverse Mercator Grid. The map sheets are indexed by an eleven digit number. The first three digits represent the map scale in thousands, the next four the easting and the last four the northing of the southwest corner of the map sheet expressed in hundreds of metres. Qatar's extensive horizontal and vertical control networks helped to ensure base map accuracy.

Both the 1:1000 and the 1:10,000 digital topographic map files are stored as ARC/INFO coverages and are on-line in a read only mode, around the clock, to all users. Since every agency in the State of Qatar uses ARC/INFO for their GIS applications there are no conversion problems to face; and with the standards set by the National GIS Steering Committee, compatibility abounds. This is one of the major reasons Qatar's progress in the development of its GIS has been unimpeded.

In addition to having 1:1000 and 1:10,000 scale digital maps for all urban areas, Qatar has total coverage at 1:500,000 and 1:50,000. It plans to complete 1:10,000 scale mapping for the entire country in the near future.

DIGITAL BASE MAP DATABASE SPECIFICATIONS & DATA DICTIONARY

Once organized, The Centre for GIS began almost immediately to develop a specification which would provide a highly accurate, on-line Digital Base Map Database. The database provides adequate resolution for the production of customized 1:1000 and 1:10.000 scale maps. It is structured so that all potential users can integrate their own and other themes to the base map features for the purposes of spatial analysis, report generation and graphic display. In April 1990 Qatar's DBMD Specification and Data Dictionary was published. It contains an Introduction; a Glossary of terms and their definitions; the definition of a map sheet; annotation levels; a data dictionary which contains all map feature descriptions, examples, definitions, and codes including building type codes and a hierarchy of feature coding for lines that are common to more than a single polygon feature; it defines the various map sheet layers or coverages together with a list of the features and codes found in each coverage; and lists a series of quality assurance procedures. Mapping contractors were provided with a copy of the specifications and they agreed to meet it.

QUALITY ASSURANCE PROCEDURE

The Quality Assurance Procedure developed by The Centre for GIS is in fact an elaborate, highly automated examination process for monitoring and enhancing the digital map files supplied by Contractors. This quality assurance procedure ensures the digital map files that are entered into Qatar's DBMD are literally error free, and feature representation is complete as of the date of photography. The fact it is highly automated reduces both operational costs and the chance of human error.

ELECTRONIC PLACE FINDER

Another component of Qatar's DBMD is that street addresses have been incorporated with the streets. While beneficial to a Country where street signs and addresses are part of the way of life, this enhancement would not have the magnitude of impact that it has had on Qatar. In Persian Gulf Countries where street names and addresses have not in general been part of the culture, the impact of having street names and addresses in a Digital Base Map Database can be enormous.

Only recently have street signs been erected in Qatar and sequential home address numbers placed on all buildings. The general population did not grow up with them and so they are not yet used to them, nor yet are those who drive emergency vehicles. Traditionally people found their way about the villages and towns of Qatar, as they have in many Middle Eastern countries, by reference to some locally named land mark such as a road roundabout, a mosque or some well known public building or place. Although they were late in coming and are not widely used, Qatar's street signs contain a wealth of information in

both Arabic and English. Qatar has been divided into zones based on population. The city streets in the urban areas of Qatar have been given street numbers unique to the zone in which they are located. The zone number is depicted along with the street name and the street number on each of the street signs placed at all street intersections. While these signs were a great improvement, they alone did not significantly change the manner in which the people of Qatar find their way about. For example, each road roundabout in Doha has been given a local name which is familiar to most of the townspeople. They are often used by citizens, when reporting a fire to give its general location to the Fire Department. The problem is road roundabouts are often several kilometres apart. Thus one could frequently observe a fire truck rushing to a road roundabout and then sitting there, or driving around in circles looking for the fire until it was found, or until someone came and guided the firemen to the exact location of the fire. Likewise a citizen could order a pizza from a nearby store and not receive it for hours, if at all, because the driver could not find the home to deliver it to. People wanting to take a taxi to the airport would often drive to the taxi stand and have the taxi driver follow them home, where they would leave their car and then take the taxi to the airport. These are true stories, but things are beginning to change thanks to the DBMD and its ability to identify any address or place in the urban centres of Qatar.

For the convenience of the citizens, businesses, and some government agencies, The Centre For GIS developed a PC program called Electronic Place Finder (EPF) which contains the street network portion of the DBMD complete with addresses and land marks. EPF available to anyone for an nominal fee (US $ 275), is beginning to find its way into Government agencies, private businesses and homes alike, where it is used for a multitude of purposes. By far the most common use is for finding and displaying the location of an address or place, hence the name Electronic Place Finder or EPF for short. It has already reduced response times for both emergency and delivery services by an order of magnitude.

The street network portion of the DBMD is bilingual, street names and landmarks are in Arabic and English. The addresses at intersections, the names and numbers of all streets and the locations and names of all major buildings and cultural features have all been loaded into the DBMD and hence to EPF. To apply the addresses to individual places a subroutine proportions between the known addresses at street intersections which were derived from field observations.

The EPF operates on an IBM compatible personal computer outfitted with a minimum 10 Megabyte hard drive, VGA or better graphics card and minimum 2 MB of RAM. The more powerful the personal computer, the faster the display. EPF allows users to produce a graphic display of the planimetry of an area in which

the address they are interested in finding is both highlighted and pinpointed by an arrow on their screen.

The EPF menu provides several options to locate a place, such as address or telephone number etc. The first option is Address, which if chosen opens up a space on the screen in which the address sought can be entered in Arabic or English. Pressing the Enter key causes the underlying city map to instantly give way to a much larger scale map, near the centre of which is the place sought both bolded and pinpointed by an arrow displayed on the screen. The second menu option is Telephone, which if chosen requires tne user to type in the telephone number of the place sought. Since telephone numbers are considered classified information in Qatar only those telephone numbers of public buildings, government offices and hotels are pre-loaded in the system. Users however, have the option of adding any telephone numbers they wish to their own copy of EPF and these too may be used as search keys. There are several other options that make EPF a very useful tool for locating places in Qatar.

URISA AWARD 1992

Qatar's unique approach to implementing GIS nation-wide has attracted attention from around the world (*see article in GIS World - January 1994 issue*). Qatar first got top level management support from the cabinet, then involved every Government Department in developing National specifications and developed implementation strategies that ensures harmony in data collection and integration of all government departments. Qatar's work was displayed at an international GIS conference held in Doha, Qatar in January 1993, and attended by 1,200 delegates from 17 countries.

The Centre for GIS, State of Qatar, won the 1992 "Exemplary Systems in Government Award" from The Urban and Regional Information Systems Assiociation (URISA) whose headquarters are in Washington D.C., U.S.A.

Different government agencies from around the globe have the opportunity to compete for this highly prestigious annual award. The award is presented in recognition for exceptional achievement in the application of computer technology that significantly improves the delivery and quality of government services. Some of the past winners of this award include Sweden's "Land Data System", Canada's "Land Data System", Australia's "Queensland Cadastral Mapping System" and California's "Merced Global Information System". Qatar's "Centre For GIS" now joins this prestigious list of winners.

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COUNTRY REPORTS ON THE CURRENT STATUS AND ISSUES OF SURVEYING, CHARTING AND MAPPINC AT THE NATIONAL LEVEL: NEEDS AND REQUIREMENTS VERSUS REALITY IN THE REGION

Surveying and mapping activities in Mongolia

Paper submitted by Mongolia**

* E/CONF.87/1.

** Prepared by D. Gangsukh and J. Sanjaajamts, State Administration of Geodesy and Cartography, IkH Toyruu str. 4, 210644 Ulaanbaator, Mongolia.

I. THE MONGOLIA

Mongolia is a developing country in Central Asia. Its area is 1565,5 thousand sq.km. It is far from seas and oceans. Different regions of the country differ considerably from each other by their structures of relief and elevations. The medium elevation of the territory is 1580 m above the sea level, and highest mountain summit reaches 4374 m. The lowest area in Mongolia is 560 m.

In Mongolia there are 3440 rivers and 3000 lakes, but most of them are situated in the northern part of the territory.

Such physiographic traits of Mongolia determine severe nature, sharp continental climate and frequently unfavourable weather conditions.

Mongolia is the 17th country by its territory size, and it has about 2,1 million people. It means that there are about 0,8 inhabitants per a square kilometre.

For the past 70 years Mongolia has been a socialist state under the influence of the former Soviet Union. In 1990 its people have chosen democracy and market economy as a new policy seeking economic development.

II. Mongolian Geodetic Service

Before the establishing of the Mongolian Geodetic Service /MGS/ in 1970 several bureau and groups of surveying and mapping tasks of some ministries and boards used to work for their needs.

The Mongolian Government has decided to establish the State Administration of Geodesy and Cartography /SAGC/ in 1970, in order to concetrate surveying and mapping activities in the country.

In 1991, the SAGC has been mandated by the Governmental decree with the management of surveying and mapping infrastructure of the country, with the preparation, planning implementation of technical projects and inspection of all kinds of work in the field of surveying and mapping.

Nowadays, the Mongolian Geodetic Service consists of SAGC- a main body, two semi-autonomous enterprises and three field parties.

Since MGS had won status there began a new history of surveying and mapping activities in Mongolia, and for military and civil purposes they are working for provide surveying and mapping products, essentially topographic base maps in the industrial and urban areas.

In the period of review we used traditional technology of mapping, based on techniques from Russia and other former socialist countries. Our national specialists in MGS are mainly trained in above-mentioned countries and in a home-country.

III. CURRENT STATUS OF SURVEYING AND MAPPING

Since Mongolia had won its independence in 1924 there began a new history of physiogeographic and other studying of territory of Mongolia and some thematic map production activities for the public and educational needs. Those maps and atlases had been compiled in Mongolia and published in Germany.

In 1932 there was established a mapping department at the Ministry of the Mongolian military.

Concerning the Mongolian defence requirements the former Soviet Union had constructed a geodetic control network covering a whole territory of the country with the maps at the scales of 1:1 000 000, 1:500 000, 1:200 000 and 1:100 000. These maps had been based on the 1942 coordinating systems of Krassovsky ellipsoid and Gauss conformal cylindrical projection.

In the period of review MGS has done density of the geodetic control network, renewed second order levelling network by repeated levelling and developed national gravimetric network.

MGS had done revision of the topographic maps of the scales of 1:100 000 and 1:200 000 of the whole territory of the country, and has edited and published an Album of the geographic names og Mongolia.

Up to now 33% at the whole territory of Mongolia had been covered with the topographic maps at the scale of 1:50 000 and 17% with topographic maps at the scale of 1:25 000 by stereotopographic methods.

Large scales (1:5 000, 1:2 000, 1:1 000 and 1:500) of topographic maps made for urban areas.

MGS began to use airborne-laboratory AN-30 for the aerial photography since 1980, which helps for a future development of photogrammetry and remote sensing technology.

One of the examples of the effective uses of space imagery in mapping purpose was completed in 1980-s Complect of thematic maps at the scale 1:1 000 000 /7 kind/.

Today MGS has edited and published more then 200 various maps and atlases for the public, cultural, scientific needs and educational purposes.

In 1991, we have published the National Atlas of Mongolia, and it is an integrated fundamental scientific cartographic work, generalizing present-day scientific knowledge about the country's nature and population, and it intended for solving both scientific-theoretical and practical tasks.

IV. DEMANDS ON THE FUTURE DEVELOPMENT OF THE SURVEYING AND MAPPING ACTIVITIES

Surveying and mapping are fundamental tools for the development and many other development activities in Mongolia. The production of maps, especially medium scale maps

will increase in accordance with the high depend on a precise, up-to-date, spatially referenced data base for the socioeconomic development in Mongolia, the utilisation, exploration and exploitation of its rich natural resources.

The demand for cadastral surveying will also be increased in Mongolia as a result of changes of land policy which was outlined in the Constitution and other relevant laws.

The main activities of MGS in near future are:

1. The preparation and ratification by Parliament "Land Survey Act";
2. The establishment of geodetic control survey by GPS;
3. The production and revision of National topographic map series of Mongolia;
4. The research in computer aided mapping technology;
5. The establishment of land information and cadastral system.

The future development of surveying and mapping activities in Mongolia needs international cooperation and technical and financial supports.

V. INSTITUTIONAL FACTORS

Efficient institutions are necessary for the implemention of new mapping policy and management.

1/. Organizational procedures

A proper organizational framework is a precursor for the implementation of new tasks of surveying and mapping. To provide a best framework for establishing modern surveying and mapping management, a status and forms of organization of SAGC must be renewed.

The activities of SAGC must be regulated through the Land Survey Act.

We believe that private sector will be also important part to play, both as a builder and user of surveying and mapping information.

2/. Information and Communications

A new policy of mapping in Mongolia will be directed to form an information system for computer aided mapping technology. So we will bring it into action through the government organizations, in collaboration with other systems on informations of natural resources and a land survey.

Exchanging of scientific and technological informations in the field of surveying and mapping, receiving of cheaper informations are most important to Mongolia as it is a comparatively backward country in economy and science technology.

3/. Training

Surveying and mapping development of any country depends on its trained personnel. All the people employed by the state surveying and mapping organization of Mongolia had obtained their education in former socialist countries.

Modern science and technology demand us to improve their knowledge and skills with the level of today's development. For Mongolia, it becomes most important to train and to prepare our personnel in the field of new and up-to-date techniques and technology. For this we need some help from the UN, other international organisations and highly developed countries. We're seeking to collaborate with them on the principals of mutual respect and understanding.

4/. Scientific and Research work

Scientific and research work in the field of surveying and mapping is on its first step in Mongolia. Our proposals of future expanding research, land mapping and raising their level are introduced to our government.

We'll be very grateful if colleagues of our profession would support our request to set up "an Asian and Pacific Regional Laboratory on deciphering aerial photographs" in Mongolia, concerning specific conditions of the country's physical geography.

5/. Technical Assistances and Cooperation

Mongolian Geodetic Service will take first assistances of donor-countries and international organizations on the following aspects:

a. Renewing of map printing technology;
b. Introduction of GPS technology;
c. Compiling information system for computer aided mapping technology.

We expect a decision of this conference on sending various experts and advisers through exchange programmes to developing countries, like Mongolia, in the field of surveying and mapping.

SUMMARY

Economically, Mongolia is an agricultural country with a traditional open pasture for domestic animals. Surveying and mapping service is one of the young government and science branches, originated according to the needs of the country's social and economic development. Today our government pays a considerable attention to this branch and funds its mapping service while the country's economy meets with timely obstacles. During the country's transition to the marketing system, the national geodetic service (organization) of Mongolia has certain difficulties on carrying out of its main tasks on the following items of

-economic potential and its favourable condition;
-main technology and techniques of mapping;
-training of specialists at the present level.

However, many kinds of assistances and aid of international organizations, countries and people of goodwill encourage us in the time of decisive progress of our country's democratic way of development.

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NEW TRENDS IN TECHNOLOGY, AND THEIR APPLICATIONS: HYDROGRAPHY

Accurate and detailed navigational charts: essential basis for maritime trade in East Asia and the Pacific

Paper submitted by the International Hydrographic Bureau

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Background

At the 12th UN Regional Conference for Asia and the Pacific the International Hydrographic Organization presented no less than eight papers dealing with its activities and the need for hydrography in the Region. Following the discussions concerning these papers, two Resolutions were approved by the Conference dealing specifically with hydrographic interests. The Resolutions were as follows:-

A. Hydrographic Surveying and Nautical Charting Services

1. Recommends that countries without adequate charting capabilities should request the IHO to provide expert advice on the preparation of a Project Formulation Framework for the development of a hydrographic service suited to their requirements and existing resources;

2. Further recommends that the United Nations Economic and Social Commission for Asia and the Pacific, in conjunction with the IHO and appropriate Asian and Pacific institutions, should:

i) Prepare a Project Formulation Framework for a hydrographic survey of the South China Sea with the assistance of the Regional East Asia Hydrographic Commission, UNDP and other donor agencies;

ii) Explore the possibility of preparing projects and, if practical, to prepare projects to strengthen existing regional centres such as the Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian and Pacific Offshore Areas (CCOP), in order to provide capabilities to maintain hydrographic equipment and to train maintenance and nautical cartographic personnel from countries in the Region;

iii) Sponsor a hydrographic surveying seminar/workshop for senior administrators from Asia and the Pacific.

3. Further recommends that the United Nations Department of Technical Cooperation for Development, in conjunction with the United Nations Economic and Social Commission for Asia and the Pacific and the International Hydrographic Organization should:

i) Consider creating a post of United Nations/IHO Regional Hydrographic Technical Adviser at the U.N. ESCAP Secretariat;

ii) Consider the award of fellowships to suitable students from developing countries to attend courses in hydrographic surveying and nautical charting.

iii) Report progress at the 13th United Nations Regional Cartographic Conference for Asia and the Pacific.

B. Status of Hydrographic Surveying and Nautical Charting

1. Requests the United Nations Department of Technical Co-operation for Development to distribute IHO Publication SP-55 as widely as possible;

2. Recommends that coastal States in Asia and the Pacific Region should give urgent study to the IHO Publication SP-55 "Status of Hydrographic Surveying and Nautical Charting Worldwide, First Edition, Jan. 1991" and should report any changes required and any new information needed to complete the Report so as to reach the International Hydrographic Bureau, in Monaco, by 1 January 1992;

3. Requests the International Hydrographic Organization to issue updated editions of its publication SP-55 at regular, two-year intervals and report on the Status of hydrographic surveying and nautical charting to the 13th United Nations and Regional Cartographic Conference for Asia and the Pacific.

Three years later we are able to trace the progress made both to satisfy the fulfillment of these Resolutions and also to identify the economic trends in the Region with respect to maritime trade and also the progress in hydrography and navigational charting.

Shipping

The major increase in economic prosperity in East Asia is indisputable. Whether this also extends to the Pacific island countries and into western Asia may be questioned. The Gulf war undoubtedly resulted in a perturbation to the economics of countries in that area but in South East Asia a visit to any of the great cities will convince even the most casual observer of the increasing prosperity. Further north, where perhaps the Japanese economy may be seen to slow down, the Chinese economy is picking up at a fast pace.

For coastal, and particularly for island states there is a clear relationship between the overall economy and the growth of marine transportation. Recent papers describe the growth in merchant shipping fleets and the carriage of commodities in the region. This is particularly the case for ASEAN countries where it has been estimated that some 80% of the total external trade, comprises seaborne trade. The steady increase in the volume of cargoes carried and consequently the amount and size of shipping is evident in the major seaports, such as Singapore, Hong Kong and the Tokyo area.

Hydrographic Surveys and Charting

Although there is considerable activity by established national Hydrographic Offices in the region the overall progress of improving the navigational charts has been slow and there are no significant changes from the status of hydrographic surveying and nautical charting as reported at the previous Conference. The International Hydrographic Organization (IHO) continues to express its concern for the state of knowledge of such major trading thoroughfares as the South China Sea. A recent matter proposed for the attention of the Sub committee on the Safety of Navigation of the International Maritime Organization (IMO) has been a proposal to extend the traffic routeing system in the Malacca Straits. Such a proposal requires new hydrographic surveys of some of the shoal areas along the proposed routes. The proposal was made by the Oil Companies International Maritime Forum (OCIMF). The Malacca Straits and Singapore have been stated to be the busiest in the world after the Dover Straits and attention to their navigational safety must take high priority. Earlier attention to this matter was given in 1969-74 when the Malacca Straits Council, Japan and three coastal states combined their efforts to carry out detailed surveys and produce new charts. As shipping increases the need to improve these maritime highways increases.

While highly critical areas such as the Malacca Straits become obviously in need of attention there are many many other areas where the data is sparse and possibly inaccurate in terms of modern standards. While many vessels may safely transit the South China Sea and the numerous channels passing through the Indonesian and Philippine archipelagoes it takes but one serious accident to cause not only loss of life and property but considerable disruption to economies depending upon the sea such as fishing and tourism. The latter, in particular, is an important new source of revenue to several countries in the region and clearly disastrous maritime accidents resulting in pollution will cause major setbacks to their well being.

At present, collisions are the dominant cause of marine accidents but the statistics reveal that there are also many accidents resulting from groundings, often occurring during the typhoons which sweep the area. It has also been explained how there is a relationship between the establishment of traffic separation routes that are designed to encourage the free and safe flow of shipping and the need for improved hydrographic knowledge.

Problems of Datums

A problem that has been introduced by the advent of new technology concerns reference to horizontal datums. The majority of today's charts are still referenced to local or regional datums. Satellite systems used to navigate ships are referenced to geocentric worldwide datums. Previously the Navy Navigation Satellite System was referenced to World Geodetic System (WGS) 72 and today the Global Positioning System (GPS) is referenced to WGS-84. Consequently the differences between the position the navigator may obtain by reference to the chart and that obtained from the satellite receiver may be significantly different. Although the IHO has resolved that all charts should have a legend pointing out this difference to navigators and in the case of new charts that they should actually be constructed on WGS-84 datum, major problems still exist. On the one hand the task of recompiling the many charts (3000 is the world wide UK Admiralty chart coverage) will, using present technology, take many many years. On the other hand there are countries in the Region which are bound by their national laws to produce all charts referenced to their national datums and not to the World Geodetic System.

Looking at these matters more positively the satellite technology will now not only permit the offshore surveys to be carried out with much greater accuracy than previously but it will be also possible to improve the overall geodetic framework. Such programmes have recently been reported as ongoing in several countries in East Asia. Such technology will also permit the numerous scattered islands in the Pacific Ocean to be brought together in a common geodetic frame.

Electronic Charting

Another new technology is having major effects in navigational charting. This is the introduction of Electronic Chart Display and Information Systems(ECDIS). Interest in this technology developed in the early 1980's as a development from simple chart plotting devices. The IHO, working with the IMO has developed precise performance standards for the development of ECDIS. Under these standards it will be possible for ships to carry the electronic equivalent of a paper chart. These systems will in fact, be a type of marine geographical information system that can be used for navigation. In September 1993 the Sub-Committee on the Safety of Navigation of IMO recommended the Performance Standards for ECDIS to be approved by the parent body. The approval process is expected to take about two years with a target of 1995 for their final approval.

The development of this new technology has put a major pressure on national Hydrographic Offices to develop the digital chart data for the ECDIS. The IHO has spent several years in developing a detailed exchange standard that must be used in transferring the digital data between the HO's and between them and the ECDIS users. The standard, which primarily consists of an object code and an exchange format, is complex and demanding but is considered to provide data that will satisfy all the needs of the navigator using ECDIS. National HO's have now started the major task of capturing the digital data. In most case this is being achieved by digitizing the paper charts. There is a definite problem in this procedure when the original paper charts are the result of old and inaccurate surveys and also when they are referenced to non-geocentric datums, as discussed previously.

In this region the Japanese Maritime Safety Agency has embarked on a major programme aimed at producing digital data for all Japanese coastal waters by 1995. Work on the development of ECDIS has also been reported from China. Shipping is an international business and the data base for ECDIS must be extended to cover all major shipping routes and eventually all maritime areas.

Activities of the International Organization in Asia and the Pacific

One of the important organizational mechanisms of the IHO is its Regional Commissions. At present it has nine of these of which there are now two covering our present area of interest. The East Asia Regional Hydrographic Commission was established in 1971 and its present chairman is the Malaysian Hydrographer. During 1993 a new Commission was inaugurated for the South West Pacific, with Australia providing the chairman. The Regional Commissions provide an important forum for information exchange, covering all areas of hydrography. In western Asia, where there has latterly been a surge in interest in hydrography, several countries are now in the process of joining the IHO and it is clear that the formation of another Regional Commission would be useful.

The IHO continues to promote the idea of a South China Sea project directed at providing a coordinated effort to greatly improve the charts of this much travelled area. To attract the interest of any of the international funding agencies it requires the solid support of all countries surrounding the area. Issues of sovereignty are thought to be the cause of less than total commitment to this project. Also the fact that improved charts will mainly benefit international through traffic rather than the coastal states, undoubtedly has an effect on how the coastal states will weigh the necessary offshore surveys in their priorities.

In view of the proposed extension of the traffic separation routes in the Malacca Straits the coastal states are being asked to carry out surveys of certain shoal areas. However they may well ask if that is their responsibility or the responsibility of the flag states of the international shipping. The fact that such a proposal was raised by the Oil Companies International Marine Forum should introduce the question of should the user pay. Japan's early initiative to assist in hydrographic work may well be repeated but should this obligation extend to all flag states whose shipping transits this and other international waterways ?

The East Asia Regional Hydrographic Commission has been responsible for arranging several useful workshops and seminars for the exchange of information. A recent seminar, held in Tokyo in November 1994, addressed the problems of horizontal datums for charts that was discussed earlier. Although the solutions were not immediately forthcoming, the identification of the problem and the discussion of the progress by the HO's in the Region were well worthwhile.

An important and major long range programme of the IHO is the development of the INTernational chart. It was realized over twenty five years ago that there was considerable duplication of effort in the production of charts by different nations. Spurred on by reasons of sovereignty HO's produced charts of their own and other country's seas but in so doing the work was often duplicated with several HO's charting the same areas. While there is a need to produce charts in languages that are familiar to the user, there is little need to duplicate the compilation of the data itself. In order to overcome this problem a system was set up to produce one unique set of charts to cover all the seas of the world. The first step was to produce a unique chart scheme and the second step was for individual HO's to volunteer to provide a compilation of the original chart for each element of the scheme. Other HO's could then make copies of the compilation, adding their own language or other details that they wished. In order to develop the scheme Regional International Chart Committees were formed to decide on different regional components of the scheme. During recent years such components have been finalized for East Asia and the Western Pacific. One further matter that had to be decided was the financial terms under which data could be exchanged between HO's. This matter is associated with the copyright which is exercised by most HO's on their products. Arrangements are now coming into place that will permit HO's to be satisfactorily re-imbursed for their data and work and it is now hoped that this programme will move quickly ahead in East Asia and the Pacific as it has done to date in Europe. It requires the active participation of HO's in the Region to volunteer to produce the original compilations and charts.

Yet another important charting matter to be considered is the development of digital chart data, that was also discussed earlier. The work already in progress in Japan has been noted. To this might be added the significant work that has been carried out in Australia in participating in the development of standards and the technology itself. It is now necessary for the technology to be spread throughout the HO's in the region and the work be carried out to capture the digital data. Initiatives are in hand to set up a workshop in order to transfer the knowledge required to codify and prepare digital data according to the IHO Digital Data Transfer Standard. Another interesting proposal from the ASEAN HO's that deserves support is a Proposed ASEAN Maritime Operations Management Project. This project is directed at providing improved Vessel Traffic Management in the area. One of the elements of this is to develop the role of ECDIS in this activity. To achieve this it will be necessary to develop a digital data base by digitizing charts along routes linking selected seaports in the ASEAN countries.

At some future stage it will be necessary for the HO's in East Asia and the Western Pacific to decide how they can link their services with respect to ECDIS, to provide a regional rather than independent national services. Although, naturally, national shipping will expect to be served by national resources, when it comes to international shipping it will require internationally coordinated products, probably on a regional basis. Charts, whether they be paper or digital, need to be constantly updated. With the paper products this is achieved by providing Notices to Mariners, which are themselves a paper product that must be delivered to shipping agents by mail. With electronic products this is an unsatisfactory means of providing the service. Greatly improved communication networks will allow updates to be rapidly moved from HO to the user, either at sea or in port. With such media available it seems almost mandatory that such services must be coordinated by individual HO's into regional packages so that to the ship at sea, it is transparent from where the updates of its charts were obtained. Such is the organization that will be required for the future.

Financing

Finally let us turn to the important matter of financing for all the hydrographic work that is needed for the future. There was a time when the provision of hydrographic services was strongly linked with a nation's position as a trading power. With the growth of flags of convenience for shipping, this relationship does not today necessarily exist. There are several major flag states that support insignificant hydrographic capabilities. On the other hand there are many coastal states that are obliged to carry out hydrographic surveys and produce charts which are primarily used by international shipping, which may not necessarily call at its ports. If any truly significant advances are to be made to improve the global state of nautical charting it seems necessary to re-examine the financing of hydrography on the basis of user pay. Large funds have been established to pay for the costs of clean up following marine accidents resulting in marine pollution. It seems that it would be far better if , at least some portion of these funds were used to support activities that would prevent accidents rather than to pay for the results of the pollution following the accidents.

Conclusions

Referring to the Resolutions related to hydrography and nautical charting which were adopted during the 12th UN Regional Cartographic Conference for Asia and the Pacific in 1991 the major actions taken by the IHO were as follows:

1. IHO Publication 55 "Status of Hydrographic Surveying and Nautical Charting Worldwide"

This publication has found wide distribution and is frequently referenced in other publications.

According to the responses to a questionnaire distributed to IHO Member States, lists and tables of this publication were updated. The updates were communicated to the UN Department of Technical Co-operation for Development. It should be noted that no significant improvement of the status could be stated, i. e. the overall situation remained practically unchanged; this applies also to the Asia and Pacific region.

2. South China Sea Project

The initial Project Document has been continually updated, mainly by close co-operation of littoral states coordinated by the HO of the Philippines.

To date the Project is still awaiting implementation as no donor countries nor organizations could be found.

3. ASEAN Maritime Operations Management Project

This project has been jointly initiated by the HO's of the ASEAN countries. Its principal aims are the enhancement of safety of navigation and the reduction of risks of oil pollution by creating the basis for and introduce modern systems for the management of maritime traffic. This requires the establishment of ECDIS Data Bases and the subsequent creation of Vessel Traffic Management (VTS) systems in and between major ports of the region.

Funding of this project remains at present a crucial issue.

4. International Bathymetric Chart of the Western Pacific (IBCWP)

This project is an initiative of the regional WESTPAC organization of the (IOC) Intergovernmental Oceanographic Commission. It is planned to produce a large series of 1: 1 million scale bathymetric maps covering the entire western Pacific Ocean. IHO Member States are actively participating in this endeavour.

5. Technical Assistance

The IHO is continuing its efforts to provide technical assistance, also to non-Member States. Actions concentrated on finding sources to finance projects and on training. The European Community (EC) has recently been contacted to investigate the possibility of EC funding for projects. An EC funded project has recently been executed in the south-west Pacific by a French vessel equipped with a swathe sounding system.